METHOD AND APPARATUS
TO SELF-CONFIGURE AN ACCESSORY DEVICE

CROSS RELATED APPLICATION

This application is related to pending (Customer Docket Number CM06393J) by Pinder et al, entitled "Interface System for an Accessory and a Communication Device" and assigned to Motorola. Inc. being filed concurrently herewith and pending (Customer Docket number CM06376J) by Higgins et al.; entitled "Audio Accessory Optimization System" and assigned to Motorola. Inc. being filed concurrently herewith.

TECHNICAL FIELD

This invention relates in general to accessories for communication devices, and more particularly the identification of an accessory by a communication device.

BACKGROUND

Many of today's communication devices, such as two-way radios and cell phones, connect to an array of accessories that are of varying complexity. Some of these accessories contain a microprocessor and are considered "smart", while others are less complex. Radio accessories often need to be identified to properly activate support for the accessory. Differentiation amongst accessories can be provided by software, electrical modules, or by mechanical differences within the accessories. To

differentiate accessories using mechanical differences requires addressing the practical limits of external accessory density and size. A modular design minimizes engineering development resources by allowing generic devices to be built and then customized quickly based on customer demand. The use of modular designs, however, can complicate device identification because the device identification information may have to be changed when the accessory is modified, reconfigured, or upgraded. Having to re-program the information is highly undesirable, and if the upgrade or re-configuration is performed by the customer, may not even be possible.

Accordingly, there is a need for a common accessory platform that can be used for multiple accessory configurations and which allows the accessory to reconfigure itself.

BRIEF DESCRIPTION OF THE DRAWINGS

The features of the present invention, which are believed to be novel, are set forth with particularity in the appended claims. The invention, together with further objects and advantages thereof, may best be understood by reference to the following description, taken in conjunction with the accompanying drawings, in the several figures of which like reference numerals identify like elements, and in which:

FIG. 1 is a block diagram of an accessory with self-configuration capability in accordance with the present invention; and

FIG. 2 is a flow chart for a method of self-configuring an accessory in accordance with a preferred embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

While the specification concludes with claims defining the features of the invention that are regarded as novel, it is believed that the invention will be better understood from a consideration of the following description in conjunction with the drawing figures, in which like reference numerals are carried forward.

In accordance with the present invention, there is provided herein an accessory platform that allows for multiple accessory configurations. The accessory is able to reconfigure itself by updating operating parameters stored in accessory memory when optional operating configurations are detected.

FIG. 1 is a block diagram of a radio 102 and an accessory 104 with self-configuration capability formed in accordance with the present invention. Accessory 104 includes a microcontroller 106 making it a "smart" accessory. An interface 108 couples the accessory 104 to radio 102 via a serial data bus 110. In accordance with the present invention, accessory 104 contains at least one embedded serial memory device 112 containing information pertaining to accessory parameters, such as identification ID, accessory type, and port configuration information. For the embodiment shown in FIG. 1, a single wire representation is shown wherein embedded memory 112 is a single wire type device being accessed by serial bus 110 via switches 132, 133 under the control of accessory controller 106. A main communication bus 140, such as RS-232 or USB, is available for data communication between radio microcontroller 142 and accessory microcontroller 106.

The serial memory device 112 may be one of many different types of serial memory devices, such as a single wire 1- Wire® device from Dallas Semiconductor, a two wire I²C™ device available from Phillips Electronics, or a three wire Serial Peripheral Interface (SPI) memory device to name but a few. The serial data bus 110 provides bi-directional data and optionally clock signals to and from the serial memory device 112. Depending on the device type, the serial data bus 110 may also provide power to serial memory device 112.

The smart accessory 104 of the present invention includes at least one and preferably a plurality of optional and selectable configurations with which to self-configure the accessory. These configurations can encompass mechanical, electrical, and/or software configurations. The smart accessory 104 of FIG. 1 optionally contains electrical functional modules 114 whose presence enhances the capabilities of the device, shown in FIG. 1 by "Electrical Option #1" and "Electrical Option #2". These electrical modules 114 may be user-installed or factory installed. The factory-installed options may share the same printed circuit board as the accessory with installation consisting of placement of the appropriate parts. One example of an electrical option in accordance with the present invention is a GPS plug-in board to a smart microphone.

The smart accessory 104 optionally includes multiple mechanical configurations 120 with substantially identical electrical components and identical software to support all configurations. Sensors and/or sense lines 122 indicate to the microcontroller 106 what configuration is present and direct the software to operate accordingly. An example would be a smart microphone that can have two configurations: a standard half-duplex configuration and an optional full duplex

configuration replacing or supplementing the half duplex configuration. The configuration is determined late in the manufacturing process and might even be changed by the customer after the accessory is purchased. The accessory software senses the presence of the full-duplex option if it is present and will update the configuration data 130 if it differs from the detected configuration. The radio, upon detecting the new configuration, will adjust operation accordingly.

The smart accessory 104 may further include software options 124 within a non-volatile program memory 116. These software options extend and enhance the operation of the accessory. Such options can be installed after production during a customization stage, or by a customer using a programming fixture or even the radio itself. The software options 124 can optionally be present all along and can be activated during customization or during a radio upgrade.

For the embodiment shown in FIG. 1, the serial memory device 112 includes device ID 126, and further includes flags 128 installed to enable software options and data 130 for the electrical and mechanical options.

Switches 132, 133 are used to ensure exclusive access to serial memory device 112. When switch 132 is open, then switch 133 is closed, thereby providing local access to memory device 112 via accessory controller 106. When switch 132 is closed and switch 133 is open, the memory 112 is accessed remotely from radio microcontroller 142. The serial memory device 112 is thus accessible through either local access or remote access, but cannot be accessed by both at the same time.

A method 200 for self-configuring an accessory in accordance with the present invention is shown in FIG. 2. Upon power-up of the accessory at step 202, the

accessory configures switches for local access (i.e. access by accessory controller 106) to the serial memory device at step 204. The accessory, at step 206, checks the sense lines for mechanical options or special configurations, checks sense lines or uses other interface means to detect the presence of any electrical options and checks program memory for the presence of software options or alternatively security flags that activate them. At step 208, upon determining the options available, the accessory microcontroller reads the device parameter data out of the serial memory device and performs a comparison at step 210. If the parameter data does not match the actual detected configuration of the accessory, then the parameter data is updated by the accessory microcontroller 106 at step 212 to reflect the options detected. If the parameter data does match at step 210, or after an update of the data at step 212, the accessory configures its switches to allow remote access (i.e. radio access) to the serial memory device at step 214. The accessory begins normal operation at step 216 and the radio detects the presence of the accessory and reads the detected options at step 218. The radio reads the parameter data, configures its accessory port, activates appropriate protocols, and activates radio software functionality to properly interface with and utilize the smart accessory and its detected options.

An example of a self-configuring accessory formed in accordance with the present invention is an accessory using the same software and printed circuit board for a single accessory that provides both a keypad microphone option and a keypad microphone with display and earpiece option. The accessory automatically self-configures its parameter information and when connected to the radio, the radio determines whether there is a remote display and whether the microphone has full

duplex audio capability. Radio software may behave differently based on the presence or absence of these options.

Another example of a self-configuring accessory formed in accordance with the present invention is an accessory with an Global Positioning System electrical option. An add-on GPS module is placed inside the accessory. Upon subsequent power-up of the accessory, the accessory detects that its actual configuration differs from its configuration stored in the serial memory device. The accessory update the stored configuration so the radio with detect the accessory as a GPS microphone and not a normal microphone.

The self-configuring accessory of the present invention thus eliminates the programming or updating of identifying information if the accessory is re-configured or upgraded. Furthermore, the self-configuring accessory eliminates the need for initial programming of the parameter data. When the accessory's microcontroller reads the serial memory device for the first time, it may find nothing. The accessory controller then loads a default image for that accessory and customizes it further based on discovered electrical, mechanical, and software options. This eliminates a process step and the need for a programming fixture during production.

Accordingly, there has been provided self-configuring accessory that allows one accessory to be configured and reconfigured if desired for multiple accessory options, whether they are electrical, mechanical, and/or software options. The preferred embodiment of the invention utilizes a single wire protocol because of its simplicity and low cost. Those skilled in the art will recognize that a variety of memory devices and buses may be used to implement the present invention without

diminishing its scope or purpose, and that the memory device might even share the primary accessory communication bus.

There are several advantages to the self-configuring device identification technique of the present invention. Generic accessory devices can now be built and customized quickly based on customer demand. An accessory can now be modified, reconfigured, or upgraded without having to go through an entire mechanical or electrical reconfiguration of the accessory or the communication device. A communication device is now able to determine not only the type of accessory, but also the presence of options or special configurations associated with that accessory and thereby modify its operation to utilize the options or special configurations.

Initial programming of device parameter data in the smart accessory is eliminated. Additional options or re-configuration during a customization phase is easily handled, with the device automatically detecting and updating its parameter information. If desired, some options can be made customer-installable as upgrades, with the smart accessory automatically detecting and updating its parameter information.

While the preferred embodiments of the invention have been illustrated and described, it will be clear that the invention is not so limited. Numerous modifications, changes, variations, substitutions and equivalents will occur to those skilled in the art without departing from the spirit and scope of the present invention as defined by the appended claims.

What is claimed is: